

CLAIMS:

1           1.    A method comprising:  
2                receiving a digital signal, wherein the  
3   digital signal contains robust VSB data, and wherein  
4   the digital signal further contains a map permitting a  
5   receiver to process the robust VSB data, wherein the  
6   robust VSB data contains a duplicate of the map; and,  
7                processing the robust VSB data and the  
8   duplicate of the map in response to the map.

1           2.    The method of claim 1 wherein the map  
2   contains information indicating which robust VSB data  
3   has been outer coded at different rates, and wherein  
4   the processing of the robust VSB data comprises  
5   decoding the robust VSB data based upon the different  
6   outer coding rates indicated by the map.

1           3.    The method of claim 1 wherein the map  
2   indicates the location of the robust VSB data in the  
3   digital data, and wherein the processing of the robust  
4   VSB data comprises processing the robust VSB data based  
5   upon the location of the robust VSB data as indicated  
6   by the map.

1           4.    The method of claim 1 wherein the map  
2   contains information indicating that the digital signal  
3   contains first and second robust VSB data, wherein the  
4   first robust VSB data has been outer coded at a first  
5   rate, wherein the second robust VSB data has been outer  
6   coded at a second rate, wherein the map contains  
7   further information indicating location of the first  
8   and second robust VSB data, and wherein the processing  
9   of the robust VSB data comprises decoding the first and  
10   second robust VSB data based upon the respective first  
11   and second outer coding rates indicated by the map.

1           5.    The method of claim 1 wherein the  
2   processing of the robust VSB data comprises correlating  
3   multiple transmissions of the map.

1           6.    The method of claim 1 wherein the  
2   duplicate of the map also contains data indicating when  
3   in the future the map will change.

1           7.    The method of claim 1 wherein the  
2   duplicate of the map also contains a new map to be  
3   transmitted in the future.

1           8.    The method of claim 7 wherein the  
2   duplicate of the map also contains data indicating when  
3   in the future the new map will be transmitted.

1           9.    The method of claim 1 wherein the map  
2   contains information indicating which of the robust VSB  
3   data has been outer coded at a first coding rate, which  
4   of the robust VSB data has been outer coded at a second  
5   coding rate, and which of the robust VSB data has been

6 outer coded at a third coding rate, wherein the map  
7 comprises first, second, and third portions, wherein  
8 the first portion indicates where in the digital signal  
9 the robust VSB data having the first coding rate can be  
10 found, wherein the second portion indicates where in  
11 the digital signal the robust VSB data having the  
12 second coding rate can be found, and wherein the third  
13 portion indicates where in the digital signal the  
14 robust VSB data having the third coding rate can be  
15 found.

1 10. The method of claim 9 wherein the map  
2 comprises fifty-four symbols, wherein the first portion  
3 comprises a first eighteen of the fifty-four symbols,  
4 wherein the second portion comprises a second different  
5 eighteen of the fifty-four symbols, and wherein the  
6 third portion comprises a third different eighteen of  
7 the fifty-four symbols.

1           11. The method of claim 10 wherein the  
2 first, second, and third eighteen symbols each  
3 comprise:  
4           six symbols designated as G indicating where  
5 in the digital signal the robust VSB data having  
6 corresponding one of the first, second, and third  
7 coding rates can be found;  
8           six symbols designating the complement of G;  
9 and,  
10          six unspecified symbols.

1           12. The method of claim 11 wherein the map  
2 is contained in the frame sync segment of an ATSC frame  
3 just before the twelve precoding symbols of the frame  
4 sync segment.

1           13. The method of claim 9 wherein the first,  
2 second, and third portions each comprise:

3           first symbols designated as G indicating  
4 where in the digital signal the robust VSB data having  
5 corresponding one of the first, second, and third  
6 coding rates can be found;

7           second symbols designating the complement of  
8 G; and,

9           third unspecified symbols.

1           14. An apparatus comprising:

2           a receiver that receives a digital signal;  
3 wherein the digital signal contains a frame of first  
4 and second 8 VSB data, wherein the first and second 8  
5 VSB data have different bit rates, wherein the digital  
6 signal further contains a map, wherein the map contains  
7 information indicating a location of at least one of  
8 the first and second 8 VSB data in the frame;

9           a decoder that decodes the digital signal;  
10 and,

11 a processor that processes the first 8 VSB  
12 data according to the location information contained in  
13 the map.

1 15. The apparatus of claim 14 wherein the  
2 map contains information indicating which of the first  
3 8 VSB data has been outer coded at different rates, and  
4 wherein the processor is arranged to decode the first 8  
5 VSB data based upon the different outer coding rates  
6 indicated by the map.

1 16. The apparatus of claim 14 wherein the  
2 map contains information indicating that the digital  
3 signal contains first and second groups of the first 8  
4 VSB data, wherein the first group has been outer coded  
5 at a first rate, wherein the second group has been  
6 outer coded at a second rate, wherein the map contains  
7 further information indicating location of the first  
8 and second groups, and wherein the processor is  
9 arranged to decode the first and second groups based

10 upon the respective first and second outer coding rates  
11 indicated by the map.

1 17. The apparatus of claim 16 wherein the  
2 processor is arranged to correlate multiple  
3 transmissions of the map.

1 18. The apparatus of claim 14 wherein the  
2 frame comprises an ATSC frame containing a frame sync  
3 segment and multiple data segments, wherein the bit  
4 rate of the first data is lower than the bit rate of  
5 the second data, and wherein the first data are  
6 included within one of the data segments and contain a  
7 duplicate of the map.

1 19. The apparatus of claim 18 wherein the  
2 one of the data segments also contains data indicating  
3 when in the future the map will change.



1           20. The apparatus of claim 18 wherein the  
2 one of the data segments also contains a new map to be  
3 transmitted in the future.

1           21. The apparatus of claim 20 wherein the  
2 one of the data segments also contains data indicating  
3 when in the future the new map will be transmitted.

1           22. The apparatus of claim 14 wherein the  
2 frame contains multiple segments, wherein a first  
3 segment contains the map, and wherein a second segment  
4 contains data indicating when in the future the map  
5 will change.

1           23. The apparatus of claim 22 wherein the  
2 apparatus is arranged to maintain a count related to  
3 when the map will change and to countdown from the  
4 count when digital data containing additional maps is  
5 received and is not received.

1           24. The apparatus of claim 14 wherein the  
2 frame contains multiple segments, wherein a first  
3 segment contains the map, and wherein a second segment  
4 contains a new map to be transmitted in the future.

1           25. The apparatus of claim 24 wherein the  
2 second segment also contains data indicating when in  
3 the future the new map will be transmitted.

1           26. The apparatus of claim 14 wherein the  
2 frame contains m data segments, wherein the map  
3 designates a predetermined plurality of the data  
4 segments, and wherein the processor locates the first 8  
5 VSB data in the predetermined segments.

1           27. The apparatus of claim 26 wherein the  
2 map comprises a number from zero to n, and wherein n is  
3 evenly divisible into m.

1           28. The apparatus of claim 27 wherein n is  
2 39.

1           29. The apparatus of claim 28 wherein, if n  
2   is 39, the m data segments contain only the first 8 VSB  
3   data.

1           30. The apparatus of claim 26 wherein the  
2   map contains information indicating that the digital  
3   signal contains first and second groups of the first 8  
4   VSB data, wherein the first group has been outer coded  
5   at a first rate, wherein the second group has been  
6   outer coded at a second rate, wherein the processor is  
7   arranged to decode the first and second groups based  
8   upon the respective first and second outer coding rates  
9   indicated by the map, wherein the map comprises a first  
10   number from zero to n indicating a first subset of the  
11   predetermined segments containing the first group,  
12   wherein the map comprises a second number from zero to  
13   n indicating a second subset of the predetermined  
14   segments containing the second group, wherein the first  
15   number plus the second number is less than or equal to  
16   n, and wherein n is evenly divisible into m.

1           31. The apparatus of claim 26 wherein the  
2 map contains information indicating that the digital  
3 signal contains first, second, and third groups of the  
4 first 8 VSB data; wherein the first group has been  
5 outer coded at a first rate, wherein the second group  
6 has been outer coded at a second rate, wherein the  
7 third group has been outer coded at a third rate,  
8 wherein the processor is arranged to decode the first,  
9 second, and third groups based upon the respective  
10 first, second, and third outer coding rates indicated  
11 by the map, wherein the map comprises a first number  
12 from zero to n indicating a first subset of the  
13 predetermined segments containing the first group,  
14 wherein the map comprises a second number from zero to  
15 n indicating a second subset of the predetermined  
16 segments containing the second group, wherein the map  
17 comprises a third number from zero to n indicating a  
18 third subset of the predetermined segments containing  
19 the third group, wherein the first number plus the

20 second number plus the third number is less than or  
21 equal to  $n$ , and wherein  $n$  is evenly divisible into  $m$ .

1 32. The apparatus of claim 14 wherein the  
2 map contains information indicating which of the first  
3 8 VSB data has been outer coded at a first coding rate,  
4 which of the first 8 VSB data has been outer coded at a  
5 second coding rate, and which of the first 8 VSB data  
6 has been outer coded at a third coding rate, wherein  
7 the map comprises first, second, and third portions,  
8 wherein the first portion indicates where in the  
9 digital signal the first 8 VSB data having the first  
10 coding rate can be found, wherein the second portion  
11 indicates where in the digital signal the first 8 VSB  
12 data having the second coding rate can be found, and  
13 wherein the third portion indicates where in the  
14 digital signal the first 8 VSB data having the third  
15 coding rate can be found.

1           33. The apparatus of claim 32 wherein the  
2 map comprises fifty-four symbols, wherein the first  
3 portion comprises a first eighteen of the fifty-four  
4 symbols, wherein the second portion comprises a second  
5 different eighteen of the fifty-four symbols, and  
6 wherein the third portion comprises a third different  
7 eighteen of the fifty-four symbols.

1           34. The apparatus of claim 33 wherein the  
2 first, second, and third eighteen symbols each  
3 comprise:

4           six symbols designated as G indicating where  
5 in the digital signal the first 8 VSB data having the  
6 corresponding one of the first, second, and third  
7 coding rates can be found;

8           six symbols designating the complement of G;  
9 and,

10          six unspecified symbols.

1           35. The apparatus of claim 34 wherein the  
2 map is contained in a frame sync segment of an ATSC  
3 frame just before the twelve precoding symbols of the  
4 frame sync segment.

1           36. The apparatus of claim 32 wherein the  
2 first, second, and third portions each comprise:  
3           first symbols designated as G indicating  
4 where in the digital signal the first 8 VSB data having  
5 the corresponding one of the first, second, and third  
6 coding rates can be found;  
7           second symbols designating the complement of  
8 G; and,  
9           third unspecified symbols.

1           (37) An electrical signal comprising a map,  
2 first data symbols, and second data symbols, wherein  
3 the first and second data symbols have the same  
4 constellation, wherein the first and second data  
5 symbols have different bit rates, wherein the first and  
6 second data symbols are intermixed in a data frame, and

7 wherein the map contains information indicating a  
8 location of at least one of the first and second 8 VSB  
9 data in the electrical signal.

1 38. The electrical signal of claim 37  
2 wherein the first 8 VSB data comprises first and second  
3 portions, wherein the first portion of 8 VSB data  
4 results from coding at a first coding rate, wherein the  
5 second portion of 8 VSB data results from coding at a  
6 second coding rate, and wherein the map contains  
7 information indicating that the first and second  
8 portions of 8 VSB data have been outer coded at the  
9 different coding rates.

1 39. The electrical signal of claim 38  
2 wherein the map contains information indicating  
3 location of the first and second portions of 8 VSB data  
4 in the electrical signal.

1 40. The electrical signal of claim 37  
2 further comprising a duplicate of the map.



1           41. The electrical signal of claim 40.  
2 further comprising information indicating when in the  
3 future the map will change.

1           42. The electrical signal of claim 40  
2 further comprising a new map to be transmitted in the  
3 future.

1           43. The electrical signal of claim 42  
2 further comprising information indicating when in the  
3 future the new map will be transmitted.

1           44. The electrical signal of claim 37  
2 further comprising a new map to be transmitted in the  
3 future.

1           45. The electrical signal of claim 37  
2 further comprising a frame of data, wherein the frame  
3 contains multiple segments, wherein the map indicates  
4 which segments contain the first 8 VSB data, and

5 wherein the second 8 VSB data are distributed in at  
6 least some of any remaining segments.

1 46. The electrical signal of claim 45  
2 wherein the frame contains m data segments, wherein the  
3 map comprises a number from zero to n, and wherein n is  
4 evenly divisible into m.

1 47. The electrical signal of claim 46  
2 wherein n is 39.

1 48. The electrical signal of claim 47  
2 wherein, if n is 39, the frame contains only the first  
3 8 VSB data.

1 49. The electrical signal of claim 46  
2 wherein the first 8 VSB data contains first and second  
3 portions of 8 VSB data, wherein the first portion of 8  
4 VSB data is outer coded at a first coding rate, wherein  
5 the second portion 8 VSB data is outer coded at a  
6 second, different coding rate, wherein the map

7 comprises a first number from zero to n indicating a  
8 first subset of the predetermined segments containing  
9 the first portion of 8 VSB data, wherein the map  
10 comprises a second number from zero to n indicating a  
11 second subset of the predetermined segments containing  
12 the second portion of 8 VSB data, wherein the first  
13 number plus the second number is less than or equal to  
14 n, and wherein n is evenly divisible into m.

1 50. The electrical signal of claim 46  
2 wherein the first 8 VSB data contains first, second,  
3 and third portions of 8 VSB data, wherein the first  
4 portion of 8 VSB data is outer coded at a first coding  
5 rate, wherein the second portion 8 VSB data is outer  
6 coded at a second coding rate, wherein the third  
7 portion 8 VSB data is outer coded at a third coding  
8 rate, wherein the map comprises a first number from  
9 zero to n indicating a first subset of the  
10 predetermined segments containing the first portion of  
11 8 VSB data, wherein the map comprises a second number  
12 from zero to n indicating a second subset of the

13 predetermined segments containing the second portion of  
14 8 VSB data, wherein the map comprises a third number  
15 from zero to n indicating a third subset of the  
16 predetermined segments containing the third portion of  
17 8 VSB data, wherein the first number plus the second  
18 number plus the third number is less than or equal to  
19 n, and wherein n is evenly divisible into m.

1 51. The electrical signal of claim 50  
2 wherein n is 39.

1 52. The electrical signal of claim 51  
2 wherein, if n is 39, the frame contains only the first,  
3 second, and third portions of 8 VSB data.

1 (53). An apparatus comprising:  
2 a receiver that receives a digital signal,  
3 wherein the digital signal contains a frame of first  
4 and second 8 VSB data, wherein the first and second 8  
5 VSB data have the same constellation, wherein the first  
6 and second 8 VSB data have different bit rates, wherein

7 the digital signal further contains a map, wherein the  
8 map contains information indicating a location of the  
9 first 8 VSB data in the frame;

10 a decoder that decodes the digital signal;

11 and,

12 a processor that discards the second VSB data  
13 and that processes the first 8 VSB data.

1 54. The apparatus of claim 53 wherein the  
2 first 8 VSB data are robust VSB data, and wherein the  
3 second 8 VSB data are ATSC data.

1 55. The apparatus of claim 53 wherein the  
2 first 8 VSB data are ATSC data, and wherein the second  
3 8 VSB data are robust VSB data.

1 56. The apparatus of claim 53 wherein the  
2 frame contains a duplicate of the map.

1           57. The apparatus of claim 56 wherein the  
2 frame also contains data indicating when in the future  
3 the map will change.

1           58. The apparatus of claim 56 wherein the  
2 frame also contains a new map to be transmitted in the  
3 future.

1           59. The apparatus of claim 58 wherein the  
2 frame also contains data indicating when in the future  
3 the new map will be transmitted.

1           60. The apparatus of claim 53 wherein the  
2 frame contains data indicating when in the future the  
3 map will change.

1           61. The apparatus of claim 53 wherein the  
2 frame contains a new map to be transmitted in the  
3 future.

1           62. The apparatus of claim 61 wherein the  
2 frame also contains data indicating when in the future  
3 the new map will be transmitted.

1           63. The apparatus of claim 53 wherein the  
2 first 8 VSB data contains first and second portions of  
3 8 VSB data, wherein the first portion of 8 VSB data is  
4 outer coded at a first coding rate, wherein the second  
5 portion 8 VSB data is outer coded at a second,  
6 different coding rate, wherein the frame contains m  
7 data segments, wherein the map comprises a first number  
8 from zero to n indicating a first subset of the  
9 predetermined segments containing the first portion of  
10 8 VSB data, wherein the map comprises a second number  
11 from zero to n indicating a second subset of the  
12 predetermined segments containing the second portion of  
13 8 VSB data, wherein the first number plus the second  
14 number is less than or equal to n, and wherein n is  
15 evenly divisible into m.

64. The apparatus of claim 53 wherein the first 8 VSB data contains first, second, and third portions of 8 VSB data, wherein the first portion of 8 VSB data is outer coded at a first coding rate, wherein the second portion 8 VSB data is outer coded at a second coding rate, wherein the third portion 8 VSB data is outer coded at a third coding rate, wherein the frame contains m data segments, wherein the map comprises a first number from zero to n indicating a first subset of the predetermined segments containing the first portion of 8 VSB data, wherein the map comprises a second number from zero to n indicating a second subset of the predetermined segments containing the second portion of 8 VSB data, wherein the map comprises a third number from zero to n indicating a third subset of the predetermined segments containing the third portion of 8 VSB data, wherein the first number plus the second number plus the third number is less than or equal to n, and wherein n is evenly divisible into m.



1           65. The apparatus of claim 64 wherein n is  
2   39.

1           66. The apparatus of claim 65 wherein, if n  
2   is 39, the frame contains only the first, second, and  
3   third portions of 8 VSB data.

1           67. The apparatus of claim 64 wherein a  
2   first section of the map comprises eighteen symbols  
3   designating the first subset of the predetermined  
4   segments containing the first portion of 8 VSB data,  
5   wherein a second section of the map comprises eighteen  
6   symbols designating the second subset of the  
7   predetermined segments containing the second portion of  
8   8 VSB data, and wherein a third section of the map  
9   comprises eighteen symbols designating the third subset  
10   of the predetermined segments containing the third  
11   portion of 8 VSB data.

1           68. The apparatus of claim 67 wherein the  
2   eighteen symbols of the first, second, and third  
3   sections each comprise:  
4           six symbols designated as G designating the  
5   predetermined segments;  
6           six symbols designating the complement of G;  
7   and,  
8           six unspecified symbols.

1           69. The apparatus of claim 68 wherein the  
2   map is contained in the frame sync segment of an ATSC  
3   frame just before the twelve precoding symbols of the  
4   frame sync segment.

1           70. An apparatus comprising:  
2           a receiver that receives a digital signal,  
3   wherein the digital signal contains a frame of robust  
4   VSB data, ATSC data, or both, wherein at least the ATSC  
5   data has PID numbers associated therewith, wherein the  
6   digital signal further contains a map, wherein the map

7 contains information indicating a location of the  
8 robust VSB data in the frame;  
9 a first processor that processes the robust  
10 VSB data based upon the map; and,  
11 a second processor that processes the ATSC  
12 data based upon PID numbers.

1 71. The apparatus of claim 70 wherein the  
2 frame contains a duplicate of the map.

1 72. The apparatus of claim 71 wherein the  
2 frame also contains data indicating when in the future  
3 the map will change.

1 73. The apparatus of claim 71 wherein the  
2 frame also contains a new map to be transmitted in the  
3 future.

1 74. The apparatus of claim 73 wherein the  
2 frame also contains data indicating when in the future  
3 the new map will be transmitted.

1           75. The apparatus of claim 70 wherein the  
2 frame contains data indicating when in the future the  
3 map will change.

1           76. The apparatus of claim 70 wherein the  
2 frame contains a new map to be transmitted in the  
3 future.

1           77. The apparatus of claim 76 wherein the  
2 frame also contains data indicating when in the future  
3 the new map will be transmitted.

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